GR 5: CQG II

Time: Tuesday 16:15–17:35 Location: ZHG007

GR 5.1 Tue 16:15 ZHG007

Circular light rays in a general-relativistic medium — •Volker Perlick — Faculty 1, University of Bremen

In the 1970s Marek Abramowicz introduced a potential on spherically symmetric and static spacetimes whose corresponding equipotential surfaces he called the "relativistic Von Zeipel cylinders" because they are the relativistic analogues of the Von Zeipel cylinders known from Newtonian gravity. A characteristic feature of this potential, and of its generalisation to axisymmetric and stationary spacetimes which was introduced a few years later, is in the fact that its critical points give the location of circular lightlike geodesics. In this talk I will discuss a further generalisation of this potential whose critical points are the circular light rays in an isotropic medium. The medium may be non-dispersive or dispersive. The case of a cold plasma will be treated in particular. With the help of this potential several known theorems on the existence or non-existence of circular light rays can be extended from the case of light propagation in vacuum to the case of light propagation in a medium.

GR 5.2 Tue 16:35 ZHG007

Low velocity test of the speed of gravity — Eva Hackmann and •Claus Lämmerzahl — ZARM and GOC, University of Bremen, Bremen, Germany

The weak field approximation of the Einstein field equations are similar to the Maxwell equations. Furthermore, in analogy to the Maxwell equations also the Einstein equations cann be given a pre-metric form with a constitutive tensor. On the one hand, from this constitutive tensor the wave propagation can be derived. On the other hand, the various parts of the constitutive tensor can be measured by observing particle motion in the gravitational field. Restricting to isotropic constitutive quantities one obtains as a particular consequence, that from the gravitational attraction together with the Lense-Thirring effect the constitutive tensor can be determined. That means the speed of gravity can be calculated from the constritutive tensor and compared to the speed of light which agree on the level of 1%. This provides an independent test of the speed of gravity compared with the measurements provided by multimessenger observations of gravitational wave events.

GR 5.3 Tue 16:55 ZHG007

Standing waves in Bopp-Landé-Thomas-Podolsky generalised electrodynamics — •Altin Shala[1] and Volker Perlick[2] — [1]Center of applied space technology and microgravity — [2]University of Bremen

We investigate the feasibility probing BLTP generalized electrodynamics with standing wave experiments in terms of energy requirements. Two kinds of media are researched vacuum and two fluid cold plasma. Dispersion relations are found and compared. A new transversal plasma mode is found which has a lower energy requirement than the thick plasma like BLTP vacuum.

GR 5.4 Tue 17:15 ZHG007

relativistic dynamics of electrical matter in minkowski force — •Bin Su — Institut für Theoretische Physik TU-Berlin, Germany

Based on invariant and objectivity of physical law is an invariant formulation of the dynamics proposed for the interaction of the electrical matter under electromagnetic field, which may be completely called the relativistic dynamics in Minkowski force of electrical matter of points mass . Starting from these two relativistic principles - invariant physical law and constant light velocity [1] an initial charge beyond the initial mass of moving electrical matter is at first put forward according to corresponded relativistic dynamical equation. The dependence of the moving charge on its movement, velocity, leads the initial charge into the kinetic charge of the matter accompanied by its kinetic mass. We discuss then a relativistic mass to charge ratio of electron under a magnetic field as an application of this dynamical equation and get a new formulation of the mass to charge ratio, which might be more precisely than that in classical formulation [2]: if the Electrons move very more slowly than that of light then it approximates to classic one well-known.

[1] A. Einstein, *Grundzüge der Relativitätstheorie*, S42-S50, Springer Verlag, 12.1954 [2] Metzler Physik, S 232, www.schroedel.de